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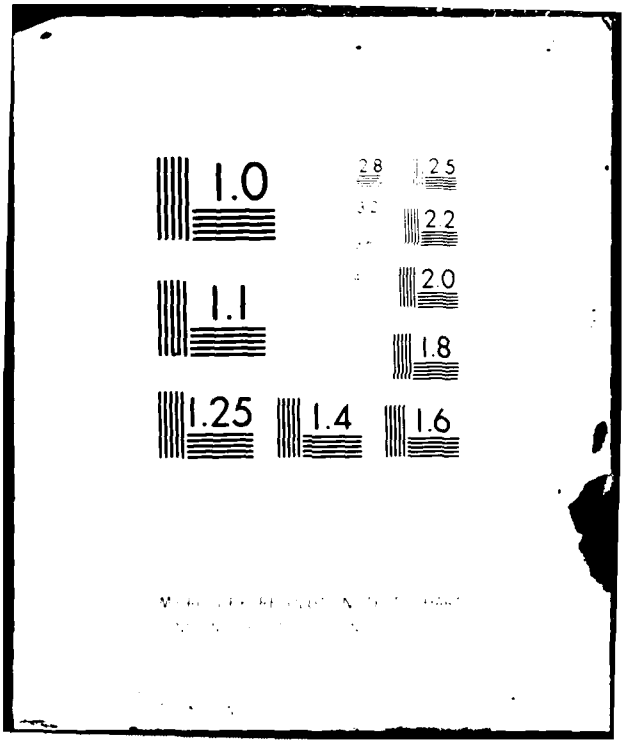
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THE PERSIAN GULF AND THE NATIONAL INTEREST

With gasoline lines a fading memory, it is easy for Americans to misinterpret the energy crisis as overinflated, and even easier to underestimate the importance of the Persian Gulf. Yet, it was just two years ago that former President Carter designated the Persian Gulf as a region of "vital" national interest. His purpose, in what came to be known as the Carter Doctrine, was to help ensure the steady flow of petroleum to the world market. President Reagan has subsequently confirmed that policy by increasing the U.S. military presence in the Indian Ocean, strengthening the Rapid Deployment Force (RDF), and selling AWACS and other advanced military equipment to Saudi Arabia.

What seemed to be a sensible policy direction with the turmoil in Iran, skyrocketing oil prices, and the Soviet intervention in Afghanistan, has come under increasing criticism in the light of today's plentiful supplies of oil. A growing chorus of optimists argues that reliance on the unfettered market will give us a future of abundant energy and freedom from dependence on oil imports [1]. William Tucker's article in the November 1981 issue of Harper's, "In Case You've Missed It...The Energy Crisis Is Over!" is typical of their reasoning [2]. Like Tucker, most of them base their optimism on the advantages flowing

from decontrolled (and higher) prices. Higher prices compensate for scarcity by retarding consumption and stimulating production--including the production of substitutes. Skeptics are admonished to behold the current oil glut, the reduction in U.S. petroleum imports, and all that shale oil in Colorado and Utah just waiting to be produced.

In addition to the energy optimists, there are other influential groups that would probably favor a deemphasis of the Persian Gulf in U.S. policy. The coalition of interests that support a NATO-first strategy is one example. In this connection, the wrangling in the Pentagon over resources is likely to intensify to the extent the forces for a maritime strategy--appropriate to the Persian Gulf--are acquired at the expense of land forces for NATO. Also, supporters of Israel can be expected to oppose any U.S. shift to more pro-Arab positions on Arab-Israeli issues that threaten both the peace and the production of oil. Finally, many domestic energy producers, such as those in the embryonic synthetic-fuels industry, may see the prospect of more Government largesse for their projects if the U.S. backs away from its commitment to the security of the Persian Gulf.

Beyond Current Markets. If the energy optimists are right, both the Carter and Reagan administrations have had their Persian Gulf priorities wrong. However, optimistic visions of a world awash in petroleum and a Persian Gulf of reduced strategic significance are unlikely to be sustained. Even with prudent U.S. policies that

encourage free-market forces in energy, the importance of Persian Gulf oil is almost certain to grow through the end of this century. To see why, we need to look beyond price and market theory and consider also the findings and experiences of the oil industry, and other experts. This broader approach takes into account estimates of how much conventional oil is left in the ground, where it is, how fast it might be consumed, and how quickly substitutes may become available.

Oil: How Much And Where? According to published estimates, far more conventional oil remains to be discovered and produced in the world than has been consumed thus far. Roughly 2 trillion barrels of conventional petroleum are thought to be ultimately recoverable worldwide under current or foreseeable technological and market conditions. About one-fifth of that, or 0.4 trillion barrels, had already been consumed by 1980, leaving 1.6 trillion barrels to be produced. Most of that 1.6 trillion barrels, however, is yet to be discovered [3].

With that much oil remaining, why is there a problem? For one thing, the resource is unequally distributed. Most of the known reserves are highly concentrated in a few giant fields and in a small number of countries. A survey of discoveries and production conducted by Richard Nehring of the Rand Corporation revealed that half of the oil discovered in the world prior to 1975 was in just 33 giant fields--25 of them in countries around the Persian Gulf! The remaining eight fields

are widely distributed: two each in the U.S. and USSR, and one each in Venezuela, China, Algeria, and Libya [4]. The countries around the Persian Gulf account for about one-third of the world's oil production and almost two-thirds of the oil in the world's export trade. They also have nearly two-thirds of the non-communist world's proved reserves [5, 6].

Declining Finding Rates. In addition to being unequally distributed, new oil is getting harder to find, and less and less of it is being discovered per unit of exploratory effort. In 1945, about 270 barrels of new oil could be expected for the average foot of exploratory drilling in the U.S. The finding rate has declined and is now about 15 barrels per foot of drilling--primarily because additional discoveries are coming from smaller and harder-to-find fields. The same phenomenon is being experienced by producers in the Middle East, the USSR, and others with mature petroleum industries [8].

Production Limits. Another critical point, given declining finding rates, is that the world's oil is being used up faster than new oil is being found. According to Exxon, worldwide production of petroleum has exceeded new additions to reserves for the past 10 years. As a consequence, world production is expected to reach a peak around the year 2000 and then start falling [9 and 10]. The U.S. entered such a decline 11 years ago, but it has hardly been noticed because of imports and the promise of oil from Alaska [11]. There is no overwhelming

problem when the production from an individual nation begins to decline as long as imports or economic substitutes are readily available. But what happens when world production reaches a ceiling? Obviously there can be no extra terrestrial imports to make up the shortage.

Higher oil prices and recessionary economic conditions could postpone the production peak by slowing demand. On a worldwide basis, petroleum demand is expected to continue growing, but at about 1 percent a year [12]. At that low rate, world production may not peak until after the year 2000, thus providing more time to adapt to substitute products. However, if demand grows at 3 percent or more—still less than half of what it was in the 1970s—production of conventional oil is likely to collide with limits caused by depletion and start to decline before the year 2000. At that time, the consequences could become dire for the world's economies unless substitutes are available in the quantities and with the qualities required.

Substitution Euphoria. The energy optimists take comfort in the observation that the world's reserves of conventional oil will never run dry. Long before that hypothetical point is reached, the price of petroleum will become so high that demand for it will plummet and users will shift to substitutes. However, recognizing the inevitability of substitution is one thing; appreciating the difficulties in the transition is another. The many problems that will accompany the change to a future where more coal and liquid synthetics

will eventually be used than conventional oil are often ignored or assumed away as if the technology and industrial structure already existed.

For several decades oil displaced coal. That process is now being reversed and sometime in the 1990s coal is expected to supply about as much energy in the world as will conventional oil [13]. However the costs of substituting the abundant supplies of coal for oil are not trivial and include the need for additional infrastructure and equipment to handle and to burn coal as well as to cope with resulting pollution problems such as acid rain. While solid coal and coal slurries may find some limited uses as transportation fuel, they are unlikely to displace significant quantities of petroleum for power to mobile systems.

Natural gas, environmentally the cleanest of the hydrocarbons, will substitute for some uses of oil in fixed installations, but it too is becoming more scarce. In fact, natural gas' share in the total energy produced in both the U.S. and the world is expected to shrink below current levels [13].

For transportation fuel, the principal substitute will be liquid synthetics refined from shale, coal and heavy oils. By the late 1990s, these petroleum-like liquids are expected to provide a small but increasing portion of the fuel used by aircraft, ships, trains, and highway vehicles. However, the U.S., the world's largest user of

petroleum, has yet to produce the first barrel of liquid synthetics in commercial quantities. Published goals for their production have been tumbling with recent estimates dropping to less than 1 million barrels per day by the year 2000--enough to perhaps meet 6 or 7 percent of the nation's projected demand for liquid fuel [14].

Synthetic fuels will require a new industry involving new technologies and risks. An industry capable of producing fuel in significant quantities cannot spring full blown overnight. Once the initial planning is completed and the necessary permits are in hand, several years are required to bring a single plant into production. Also, the necessary pipelines and distribution system need to be constructed. The capital costs are likely to be enormous and made all the higher because of technical and market uncertainties. The Chase Manhattan Bank has estimated that it would cost $125 billion (in 1980 dollars) for enough plants to produce 500,000 barrels a day (15). In addition, synthetic-fuel developers must find substantial supplies of water (estimates range from 2 to 7 barrels of water per barrel of synthetic crude oil produced); figure out how to dispose of spent shale or other wastes; and avoid contaminating ground water.

On top of these financial and environmental obstacles, synthetic fuels still pose other problems because their chemistry and their effects on engines are only partially understood. Synthetic crudes often have higher viscosity, aromatic content, and levels of

contaminants than conventional oil. These characteristics will add to refining costs and the resulting fuel will tend to be lower in quality than fuels produced from conventional petroleum [16]. Engine life, efficiency, and maintenance costs will be affected. Already there have been reports of fuel quality problems as the petroleum industry has relied more on heavier crudes. For example, some commercially available diesel fuels now contain substantially more sulphur than was previously acceptable [17]. In addition to problems in the civil sector, military users have reported occasional difficulties caused by a decline in the quality of some of the middle distillates (kerosines) burned by ships and some aircraft [18].

In thinking about the promise of synthetic fuels, it is instructive to recall the claims made in the 1950s for the future of the nuclear power industry in the U.S. Some advocates asserted that electricity generated from nuclear plants would be so plentiful that it would be too cheap to meter! Optimistic claims for the production from a yet-to-be synthetic-fuels industry, and the ease with which liquid synthetics supposedly can be substituted for conventional-petroleum products, should be viewed skeptically.

Persian Gulf Oil: A Critical Resource. Since petroleum-like substitutes are unlikely to become common for at least a few decades, conventional oil will remain critical to the world's economies. With nearly two-thirds of the proved reserves, the importance of Saudi Arabia

and the other producers in the Persian Gulf region is likely to grow, not wane.

Although the U.S. has reduced its petroleum consumption below the levels of the past few years, it is still expected to be the world's single, largest user of petroleum through the year 2000. Also, the U.S. is likely to continue dependent on oil imports as savings in consumption get offset by falling domestic production. Even if the nation should somehow produce enough to attain its petroleum independence, the strategic importance of the Persian Gulf in U.S. policy is unlikely to change much. Important trading partners and allies will continue to be heavily dependent on imports from the Persian Gulf. In addition, the large-volume producers in the Gulf will have enormous influence over the market price of petroleum which in turn affects the level of economic output in an increasingly interdependent world.

Fulfilling the tasks implied by the Carter Doctrine poses long-term political, economic and military challenges. It would be hard to find a more difficult region or situation in which to have the nation's vital interests at stake. Not only is the Gulf remote from the U.S. and close to the USSR, but its countries are prone to regional and domestic strife that have already disrupted world petroleum supplies. Nevertheless, the steady supply of Persian Gulf oil to the world market is far too important for the U.S. to alter its policy direction on the grounds of the current oil glut and the promise of future substitutes. Given the

critical nature of petroleum energy in the world, the Carter Doctrine is likely to end up with more strategic justification behind it than some of the other declarations of vital interest that have shaped U.S. history. The wonder is not that the U.S. is doing so much to secure its interests in that region, but that it may not be doing enough.

REFERENCES

1. Singer, S. Fred. "Bet On The Market." Foreign Policy. 45 (Winter 1981-82) 115-121; Van Hollin, Christopher. "Has the Persian Gulf Passed Its Prime?" The Washington Post Outlook (29 Dec 1981): D7.

2. Tucker, William. "In Case You've Missed It...The Energy Crisis Is Over!" Harper's (Nov 1981): 25-36

3. U.S. Congress, Office of Technology Assessment. World Petroleum Availability 1980-2000: A Technical Memorandum. Washington, D.C.: Government Printing Office (Oct 1980): 24-25

4. Nehring, Richard, "Giant Oil Fields and World Oil Resources," Rand Report R-2284-CIA, June 1978

5. U.S. Congress, Office of Technology Assessment. Op. Cit., p. 19

6. U.S. Congress, Office of Technology Assessment. Op. Cit., p. 25

7. Root, David H. and Attanasi, Ernest D. "U.S Discussions Analyzed, Peak Output Forecast." The Oil and Gas Journal (19 Feb 1979): 162-163

8. Root, David H., and Drew, Lawrence J., "General Principles of The Petroleum Industry and Their Application To The USSR." Energy In Soviet Policy, A Study Prepared For The Subcommittee on International Trade, Finance, and Security Economics of the Joint Economic Committee, U.S. Congress. (11 Jun 1981): 127-138

9. Exxon Corporation, World Energy Outlook (Dec 1979): 22; "USGS Assesses Potential Oil Basins of the World."

10. Oil And Gas Journal (4 Jan 1982): 162-163

11. Root, op. cit., p. 134.

12. "Socal: Rise In Oil Demand Won't Top 1 Percent/Year" Oil And Gas Journal (17 Aug 1981): 62-63

13. Exxon Corporation, Op. Cit., pp. 11, 27.

14. "Serious U.S. Energy Gap Seen Possible." Oil and Gas Journal (5 Jan 1981): 50

15. U.S. Navy Energy and Natural Resources Research and Development Office, "Mobility Fuels And National Security Seminar Report, (2 Feb 1981): 280-284

16. Higgins, Lindley R. "Trouble At The Interface." Marine Engineering Log (July 1981): 61

17. Delaney, Rachelle. "Even High Speed Diesel Makers Now Think Heavy Oil." Marine Engineering Log (June 1981): 43

18. U.S. Naval Material Command, Energy R&D Office, Informal correspondence, 2 Feb 1982

CNA PROFESSIONAL PAPERS - 1978 TO PRESENT*

PP 211
Mizrahi, Maurice M., "On Approximating the Circular Coverage Function," 14 pp., Feb 1978, AD A054 429

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Simpson, William R., "A Probabilistic Formulation of Murphy *Dynamics as Applied to the Analysis of Operational Research* Problems," 18 pp., Dec 1978, AD A063 761

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Sherman, Allan and Horowitz, Stanley A., "Maintenance Costs of Complex Equipment," 20 pp., Dec 1978 (*Published By The* American Society of Naval Engineers, Naval Engineers Journal, Vol. 91, No. 6, Dec 1979) AD A071 473

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Glasser, *Kenneth S., "The d-Choice Secretary Problem,"* 32 pp., Jun 1979, AD A075 225

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Dismukes, Bradford and Petersen, Charles C., "Maritime Factors Affecting Iberian Security," (Factores Maritimos Que Afectan La Seguridad Iberica) 14 pp., Oct 1980, AD A092 733

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